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THE DEMAND FOR CHILDREN IN A "NATURAL FERTILITY" POPULATION

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by

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Knowledge of factors that influence fertility levels and therefore population growth rates could serve as a vital input into a variety of policy decisions in developing nations. At this time, there is only limited information on what it is about couples' environments, backgrounds, and personal characteristics that result in their having many or few children, but among the competing theories, two have emerged as leading contenders--the supply or natural fertility theories, and the demand or choice theories. These two theories lead to substantially different recommendations with respect to policies aimed at lowering population growth rates. Efficient resource allocation would, therefore, be well served if there were some evidence as which of these theories best fits the fertility behaviour of couples in low income and developing nations. As will be evident, my aim in this paper is not to settle the demand-supply debate, but more to promote and illustrate the type of research that can eventually establish which theory is correct.

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The Competing Theories

Natural fertility is, in the words of its most famous proponent, "the fertility of a population that makes no deliberate attempt to limit births" [7, p.27]. Since natural fertility is "primarily a biological phenomenon" (ibid), it follows that in populations exhibiting this characteristic, desires for or against children play no role in determining resource allocation withing families, with completed fertility the, perhaps, unintended consequence of decisions made in other spheres of family behaviour. While one might debate why such an important element in a couple's life as children would be relegated to the catagory of residual claimant in the household decision-making calculus, the concept of natural fertility has been a popular one among demographers and social scientists, especially as a means of describing demographic outcomes in traditional and developing societies.

Henry, in his seminal article on natural fertility, indicated that populations will seldom be observed in a state of "true" natural fertility, but modern proponents of this concept have broadened it to include populations in which there is no observable attempt to avoid pregnancy for the sake of limiting family size, and or where couples are vague or unconcerned about such concepts as desired family size and "ideal" numbers of children. Accordingly, one potential indicator of a society which is in or near a natural fertility state is whether couples in that society use or demand some form of modern contraception.

If there is no use of modern contraception it may be argued that parents have no desire to restrict their family size beyond the limits imposed by the biological processes involved in conception and birth.[1]

Although somewhat of an oversimplification, in a natural fertility population, policies aimed at reducing population growth rates are likely to fall into one of two categories -- those aimed at "educating" couples both about the benefits of small families, and about the means of limiting family size (modern contraception, in particular), and those aimed at increasing the availability and acceptability of different forms of contraception (family planning programs, for example). Casual observation would suggest that the majority of population-oriented policies in developing nations, and certainly those in Pakistan, fall into one or both of these categories and are thus based on the assumption of a natural fertility population.

The demand theory, in its most general form, suggests that children are one among many potential avenues through which couples can spend their wealth and in that sense fertility decisions should be viewed in the same light as any other consumption decision that couples make over their lifetime. In fact,

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[1] If the reader is uncomfortable with the use of "natural fertility" to describe a population in this state, and would prefer some other term, so be it. This paper is not at all concerned with usefulness of the concept, or exact definition of the term, natural fertility.

it could be argued that given the sizeable proportion of a couple's resources that go toward having and rearing children, desires for children could well dominate many other areas of family decision-making.

Regardless of whether fertility desires dominate or are simply included in a couple's choice calculus, the main premise of the demand theory of family size is that children are not showered on parents in some random fashion, but rather are the result of implicit or explicit decisionmaking by parents. This theoretical framework suggests that many of the factors that bear on parental decisions to purchase consumption items from the marketplace (food, consumer durables, and so on) should also affect the "purchase" or production of children. Among the more important of these factors are the price that parents have to pay in order to have and raise another child, and the amount of resources that parents have at their disposal, that is, family income or wealth. If children are like other items consumed by households, then, as the cost of producing children rises, holding family wealth or income constant, the number of children desired and produced by parents will decline. Conversely if the cost of children remains unchanged but family income rises, then parents will want to, and indeed will, consume (produce) more children as long as children are normal goods in the economic sense of the term.

While this theory is receiving growing acceptance when applied to fertility differences in countries in which a substantial proportion of the married population uses or has used

some form of modern contraception, it is often viewed with considerable scepticism when applied to traditional and developing societies. The gist of the criticism leveled at the use of these models to understand fertility behaviour of, say, rural villagers in Pakistan is that couples in that environment do not think rationally or even consciously about the number of children they want. Partly this is a "proof of the pudding is in the eating" issue-- whether the theory is useful in studying fertility in developing nations like Pakistan depends on whether it provides a framework or language that helps us better understand some of the regularities observed in the behaviour of families and individuals living in those countries. This is an empirical question not resolvable by debating the merits of the theory.

And partly, the issue centres on what one means by rationality, conscious decisionmaking and the like. The important question with respect to demand theories is: If people appear to have no conscious, or at least only very weak preferences for a particular number of children, can the demand theory by rejected out of hand? If the answer to this question is no, then the only means of determining which theory -- demand or supply -- is valid in Pakistan is through empirical testing.

Consider the following argument: It is quite possible that in traditional societies many household decisions, including those on how many children to have, are imbedded in the fabric of society; that is, these decisions do not require individual

action, and yet were originally based on the sort of economic considerations that underlie the demand model. In other words, although couples may base their family size on community norms, that is, on the average behaviour of people like them, these norms, themselves, have been established on principles similar to those underlying the demand models of fertility.

But even if norms are "rational" in the sense that they conform to the predictions of the demand model, who originally went through the calculations necessary to arrive at these figures? The answer may well be no one person but rather society as a whole, with the process looking something like the following: At any point in time, and over time, each family can be thought of as carrying out an experiment in optimal resource allocation for the community in which it lives. These experiments will consist of some average level of behaviour and outcomes based on the behaviour of past generations, and for certain families a random element both unexpected and outside the control of the couples in question. This random element in couple's behaviour supplies the community with information on the relative costs and benefit of different life styles for people of similar social and economic backgrounds; that is, it supplies information on the wellbeing of people who, for reasons unassociated with their own desires, stray off the beaten path in one or another area of family behaviour.

As an example, a community will be able to observe the costs and benefits associated with small versus large families

simply through the varying levels of fecundity in the population.[2] Some couples, because the wife is, for biological reasons, subfecund, will have fewer children than other couples with like social and economic characteristics. Over the course of time, the community at large will be able to observe how well off, happy, rich, etc. these couples are relative to those couples with average fertility levels, and thus will know almost instinctively whether, ceteris paribus, they should strive for lower fertility. If subfecund couples tend on average to be worse off in terms of whatever welfare measures the community deems important, then future generations will do what they can to promote high fertility. Again, the community will learn of ways to promote high fertility by "observing" families whose life styles lead them to have above-average numbers of children.[3]

The point of the preceding discussion is not to argue that this is the way things are, but rather to indicate that there are

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[2] This is true so long as fecundity varies within as well ass among social and economic groups.

[3] Fertility reducing or increasing life styles do not necessar correspond to concepts of modern versus traditional families; that is, the argument given in the text should not be taken as support for "modernizing" theories of fertility decline.

processes through which people can arrive at "rational" outcomes that do not involve complex cost-benefit analyses or even a great deal of conscious choice at a particular point in time. Thus, to say that people do not plan their fertility, or are vague about the number of children they want is not in and of itself a refutation of demand models of fertility.

If we cannot dismiss on a priori grounds the demand approach to explaining fertility in traditional societies, what empirical tests are there which might distinguish between the demand and the supply models? As will be seen, the difficulty lies in developing hypotheses based on the two theories which produce different predictions for the relationship between actual fertility behaviour and other observable characteristics of couples. The stress here is on "observable" since many of the conceptual variables in both theories are difficult to measure directly and thus are not available in most data sets. For the demand theory, some examples are the opportunity cost (value) of the wife's time, the price of children, and the family's real wealth, and for the supply models, "natural" fecundity, and actual rather than stated contraceptive use. It is, infact, the use of proxies to measure some of these variables that has allowed proponents of demand and proponents of supply theories to take the same set of statistics on a population and for both to claim victory for their particular perspective.

As an illustration of this phenomenon, consider the following regression drawn from some earlier work on socioeconomic

determinants of fertility in Pakistan [7 1 7].

Table 1

Completed Fertility, All Women Ages 35 to 49

	Coefficient	T-ratio
Wealth Proxies:		
1. Husband's Education	0.38	2.0
2. (Husband's Education)^2	-0.09	-2.1
3. Electricity	0.66	2.6
4. Pucca	0.64	2.1
5. Katcha	0.23	0.9
Price Proxies:		
6. Wife's Education	-0.33	3.3
7. Rural 1	0.1	0.3
8. Rural 2	-0.03	0.2
Background Variables:		
9. Born village	0.18	0.8
10. Lived in Town	0.07	0.2
11. Current Age	0.05	2.4
Other Variables:		
12. Mortality	2.74	6.6
13. Intercept	3.31	

N= 861 R^2 = 0.10 F=7.62

Note: See appendix for definition of variables.

The sample for this regression was drawn from Pakistan's National Impact Survey (NIS) conducted in 1968-69, and consists of currently married women between the ages of 35 and 49.[4] The variables and their construction are discussed in detail elsewhere [1], but basic definitions are given in the appendix.

As the table indicates, the proxies used to measure the family's wealth position are the husband's education, and some characteristics of the house in which the family resides. If one accepts this interpretation, then the demand theory hypothesis that wealthier families have more children is supported by virtually every wealth proxy.[5] The major price-related proxy is the education level of the wife, and, again, under this interpretation the demand argument that higher opportunity cost of wife's time leads to lower fertility is supported.[6] And finally, the relative unimportance of the other variables in the regression (with the exception of the family's mortality experience) can be taken as an indication that so-called cultural differences in couple's backgrounds play little role in influencing fertility if one controls for differences in individual characteristics in the population.

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[4] The lower end of the age range is designed to restrict the sample to women who have completed or nearly completed their fertile period. The upper end is a survey-imposed maximum age.

[5] The relationship between husband's education and fertility is particularly interesting in that it indicates that the effect of income on fertility tends to decline as income (i.e., husband's education) increases.

[6] The use of schooling as a proxy for the value of wife's time for Pakistani women receives strong support from a forthcoming study [3] on the relationship between female schooling and wage rates for women who choose to work.

Can this regression be taken as validation of demand theories of fertility in Pakistan? Proponents of supply-oriented explantions for variation in fertility would argue that it cannot be on the grounds that each coefficient in table 1 can be explained purely on the basis of supply considerations.[7] One frequently-raised example is the negative effect of wife's education on the number of children ever born to her. Demand theorists treat female education as a price variable, and take its negative sign as an indication of the negative slope of a couple's demand-for-children function. In contrast, supply proponents would argue that the negative wife's education coefficient results not from a behavioural response to change in the price of children, but rather from the fact that more education implies, on average, higher age at marriage, and higher levels of contraceptive knowledge and contraceptive use. Thus female education "reduces" fertility because it shortens the period over which women are at risk of becoming pregnant, and because it acts as a proxy for separating those couples who are truly at natural fertility levels from those trying to reduce their fertility to levels below those implied by natural fertility rates. In this explanation, behaviour, in the

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[7] Citing sources of the supply explantions given in the text is not an easy matter since many have yet to be set down in the literature. Some exceptions are:
The sources of many of the supply arguments that I give above are discussions and debates on supply versus demand explanations of fertility that have taken place in conferences and private conversations over the past several years. Of particular importance are the recent IUSSP workshop on Household Models of Economic-Demographic Decisionmaking in Developing countries held in Mexico city in November, 1974, and private conversation with Richard Easterlin of Pennsylvania University, and John Bongaarts of the Population Council.

sense of a response to a change in the conditions under which the household operates, does not enter the picture.

The Impact data on which this regression is based allow us to determine at least tentatively which of these competing explanations is more likely to be true. First, the data give for each married woman the age at which she married, so we can control for duration of marriage by including in the regression age at marriage along with the wife's current age; second, we can eliminate the role played by modern contraception by stratifying the sample into those who have ever used and those who have never used any form of modern contraception[8] (the NIS contains detailed information on current and past contraceptive use).

It is important to note that, econometrically, neither of these "controls" is legitimate because both age of marriage and contraceptive use may be influenced by a couple's desires for children; that is, the causal relationship between these variables and fertility may not be undirectional. When a jointly-determined or endogenous, variable is treated as an exogenous variable, as is the case in the following empirical work, we run the risk of introducing simultaneity bias into the analysis; because of this potential bias, these tests can only be viewed as tentative explorations of the two theories.

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[8] See the note, table 2 for the definition of "modern" contraception.

Differences betwen the contracepting and noncontracepting populations of Pakistan are well illustrated by a simple comparison of the mean characteristics of the two groups. These comparisons are given in table 2 in which the sample used for the regression in table 1 is stratified along ever used/never used lines. The most striking comparison is that for the number of children ever born for the two groups -- contraceptors had on average 1.1 more children ever born than those who said that they had never used any form of modern contraception. This is true even though duration of marriage is approximately the same for the two groups, and female education levels are substantially higher for ever-used than for never-used women. Further, mortality levels among the children of those couples who have never used contraceptives are on the order of 40 percent higher than mortality levels among user's children. The means that for women between 35 and 49 in 1968-69, those who had ever used contraceptives had on average 28 percent more living children than those couples who had never used modern contraceptives.

While several interpretations can be attached to these comparisons I suggest that one strong possibility is that much contraceptive use in Pakistan during the Impact era was demand determined. Put another way, it was those couples who found themselves with unexpectedly high numbers of children ever born and living children who sought out and used modern forms of contraception. This interpretation receives further support if we look not at actual fertility, but at the fertility levels which

Table 2

EVER CONTRACEPTED/NEVER CONTRACEPTED COMPARISONS[a]

	Nonusers (N=753)	Users (N=108)
Children ever born	6.60	7.71
Husband's Education	1.38	2.22
Electricity	0.26	0.51
Pucca	0.28	0.57
Katcha	0.58	0.34
Wife's Education	0.23	0.83
Rural 1	0.39	0.32
Rural 2	0.22	0.08
Born village	0.66	0.53
Lived in Town	0.42	0.62
Years Married	23.77	23.26
Current Age	40.02	38.96
Age at Marriage	16.25	15.70
Mortality	0.25	0.18

[a]Contraceptors are those who have ever used any of the following forms of modern contraceptives: condom, diaphram, foam, jelley or cream, tampon or sponge, IUD, pill, sterilization, abortion.

couples in the two groups could have expected based on their own characteristics and the average fertility of couples like them (i.e., with the same socio-economic characteristics). Expected fertility can be approximated using the estimated coefficients in table 1, and the average characteristics for the two groups given in table 2.[9] For nonusers, expected fertility based on the preceding calculations is 6.61 children per couple, which is very close to the actual average fertility for that group (6.60 children ever born). However, for those who have ever used any form of modern contraception, expected fertility is 6.43 children ever born which implies that on average these couples had 1.3 (7.71 - 6.43) more live births than other couples in the population with similar social and economic characteristics.

Thus, it appears that excess fertility above the already high mean fertility levels in Pakistan induces couples to search out and use modern forms of contraception. Although not central to the purpose of this paper, it is worth noting that almost all family planning programs, including Pakistan's, are based on the premise that supply and availability of contraceptives are the factors explaining variations in contraceptive use. While the foregoing analysis does not rule this out as a partial explanation, it does confirm that demand factors like unexpectedly high fertility also are important in influencing couple's contraceptive behaviour; in fact, demand factors appear to dominate contraceptive choice decisions. The figures in table 2 also suggest that

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[9] Should anyone choose to check these calculations, please keep in mind that the mean value of husband's education squared is not the square of mean husband's education; the correct averages for husband's education squared are 5.42 for nonusers, and 9.28 for users.

excess or unwanted fertility occurs only at very high levels of children ever born, and therefore that programs aimed at reducing population growth rates must both eliminate unwanted births, and reduce the number of wanted or desired births.

The question that remains is whether within the noncontracepting or natural fertility population there is any evidence that demand factors are at work. To answer this question, I have recomputed the regression given in table 1 using as the base sample only those 753 women who said that they had never used any form of modern contraception. This regression is given as eq. 2 in table 3. Eq. 3 in that table adds to the original specification the age at which each woman was first married, thus introducing into the regression a control for duration of marriage. The first equation in table 3 reproduces for ease of comparison the regression given in table 1.

The change in samples from all women to those who have never used modern contraception is an attempt to rule out the correlation between female education and contraception as the explanation for the negative partial correlation between wife's schooling and fertility. As table 3 indicates, dropping "ever-used" women from the sample makes the coefficient on wife's education more negative and its t-ratio increases; supply explanations based on the education/contraception correlation would have predicted a movement in the opposite direction for both these magnitudes.

Table 3

REGRESSION COMPARISONS:
ALL WOMEN VERSUS NONUSERS[a]

Explanatory Variables[b]	All Women (N=861)	Nonusers (N=753)	
Health Proxies	eq.1	eq.2	eq.3
1. Husband's education	0.38 (2.0)	0.27 (1.3)	0.28 1.4)
2. (Husband's Education)^2	-0.09 (2.1)	-0.06 (1.3)	-0.06 (1.4)
3. Electricity	0.66 (2.6)	0.71 (2.7)	0.71 (2.7)
4. Pucca	0.64 (2.1)	0.45 (1.4)	0.52 (1.7)
5. Katcha	0.23 (0.9)	0.15 (0.6)	0.13 (0.5)
Price Proxies			
6. Wife's education	-0.33 (3.3)	-0.42 (3.7)	-0.35 (3.1)
7. Rural 1	0.10 (0.3)	0.32 (0.33)	0.41 (1.1)
8. Rural 2	-0.08 (0.2)	0.19 (0.4)	0.25 (0.6)
Background			
9. Born village	0.18 (0.8)	0.02 (0.1)	0.01 (0.05)
10. Lived in Town	0.07 (2.4)	0.24 (2.1)	0.23 (2.5)
11. Current Age	0.05 (2.4)	0.05 (2.1)	0.06 (2.5)
Other variables			
12. Mortality	2.74 (6.6)	2.76 (6.5)	2.56 (6.1)
13. Age Married			-0.16 (5.94)
14. Intercept	3.31	3.28	5.59
R^2	0.10	0.10	0.14
F	7.6	6.7	9.2

a. see note, table 2.

To determine whether female education is acting as a proxy for "exposure", that is, for the length of time over which women have been at risk of becoming pregnant, eq.3 repeats eq.2 but with the addition of age at marriage as an explanatory variable. To reiterate, supply-based theories would predict that controlling for contraceptive use and duration of exposure ought to substantially reduce the negative partial correlation between female education and fertility. Eq.3 rather strongly rejects this explanation -- the effect of wife's education on children ever born is essentially unchanged from eq. 1, both with regard to its absolute magnitude, and its significance level.[10] It appears that even within a "natural fertility" population, and controlling for duration of exposure, increases in female schooling still act as a negative influence on the number of children couples want. Demand-based theories would predict this continued negative association; supply theories would not.

Summary and Conclusions

The preceding analysis is concerned with distinguishing between two competing theories which attempt to explain observed variations in fertility behaviour in developing societies. The first of these theories, based on supply considerations like fecundity, availability of contraceptives, post partum amenoria, and a host of other "intermediate fertility" variables, states that variations in fertility in noncontracepting populations are

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[10] The small decrease in the t-ratio can be fully explained by the change in degrees of freedom due to the reduction in sample size.

due to factors not directly related to couple's desires for children. In this theory variations in the number of children that couples have are the unintended consequences of decisions made in other areas of family behaviour.

The second theory is based on a fairly straightforward application of consumer demand theory to explain variations in the number of children couples have. Thus, costs of having and raising children, and benefits that flow from children to parents are, under this theory, postulated to explain a significant proportion of the systematic component of variation in numbers of children among families.

In exploring which of these two theories better fits the facts in Pakistan, I have taken one particular partial relationship, that between a wife's education level and the number of children she has, and attempted to eliminate the major supply-related considerations. What remains is assumed to be the demand-related effect of female education on fertility which states that the more highly educated a women is, the higher is the opportunity cost of her time, and the more expensive are children to her family. Although flawed by certain methodological problems, the empirical investigation carried out in this paper points strongly toward the conclusion that demand models of fertility are just as effective in explaining variations in children ever born in "natural fertility" populations as they are in contracepting populations.

If the conclusions reached above are supported by additional research that rules out simulteneity as an explanation for

the statistical results presented in table 3, then important implications for public policy emerge: Population programs that attempt to reduce fertility in Pakistan only by improving contraceptive availability and supply are unlikely to bring fertility down to acceptable levels; couple's desires for children must also change and by substantial amounts.

APPENDIX

Variable Definitions

Wealth Variables:

Husband's Education	0: Cannot read or write 1: can read, not write 2: can read, write, grades 0,1 3: can read, write grades 2-5 4: can read, write, grades 6-9 5: can read, write, education, other.
Electricity	equals 1 if house has electricity
Pucca	equal 1 if house type is pucca (modern contruction).
Katcha	equal 1 if house type is katcha (traditional construction).

Price Variables:

Wife's Education	see husband's education
Rural 1	equal 1 for rural residents who visit towns frequently or occasionally.
Rural 2	equals 1 for rural residents who seldom or never visit towns.

Other Variables:

Age Married	Wife's age at first marriage
Age	wife's age at the time of the survey.
Mortality	ratio of child deaths to children ever born.

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